

## SOUTHERN RANGE EXTENSION OF THE WHITE FIR DWARF MISTLETOE IN ARIZONA<sup>1</sup>

Robert L. Mathiasen<sup>2</sup>

ABSTRACT.— Discovery of a small isolated population of the white fir dwarf mistletoe, *Arceuthobium abietinum* f. sp. *concoloris*, in the Chiricahua Mountains of southeastern Arizona extends the southern distribution of this mistletoe 300 miles. The rare occurrence of the mistletoe in the southwest suggests that it once had a more southerly distribution but only survived past climatic changes in a few locations.

White fir dwarf mistletoe, *Arceuthobium abietinum* Engelm. ex Munz f. sp. *concoloris*, is a serious pathogen of white fir, *Abies concolor* (Gord. and Glend.) Lindl., in the western United States (Scharpf and Parmeter 1967). Hawksworth and Wiens (1972) list the distribution of this dwarf mistletoe from southern Washington southward through the Cascade Range and Sierra Nevada to the San Bernardino Mountains in southern California. It is also known from three isolated areas: the Charleston Mountains, Nevada; Kane County in southwestern Utah; and Grand Canyon National Park, Arizona.

This note describes another isolated population recently discovered in the Chiricahua Mountains of Cochise County, Arizona. The population occurs in an area of about 60 acres in Mormon Canyon (T18S, R29 1/2 E) on the west side of the range at an elevation ranging from 7200 to 7800 feet. Growing in association with the white fir in Mormon Canyon are *Pinus ponderosa* Laws. (ponderosa pine), *Pinus strobiformis* Engelm. (southwestern white pine), *Pseudotsuga menziesii* (Mirb.) Franco (Douglas-fir), *Quercus reticulata* Humb. and Bonpl. (netleaf oak), and *Quercus hypoleucoides* A. Camus (silverleaf oak). Four other dwarf mistletoes, *Arceuthobium vaginatum* (Willd.) Presl subsp. *cryptopodium* (Engelm.) Hawksw. and Wiens on ponderosa pine, *A. douglasii* Engelm. on Douglas fir, *A. apachecum* Hawksw. and Wiens on southwestern white pine, and *A. gilli* Hawksw. and Wiens on Chihuahuan pine, are also in the Chiricahua Mountains. However, only *A. douglasii* was observed in the immediate vicinity of the infected white fir in Mormon Canyon. *A. douglasii* has rarely been collected on white fir, and

these two dwarf mistletoes can be easily distinguished by morphological characters.

The existence of such an extremely isolated population of white fir dwarf mistletoe is difficult to explain. The Chiricahua population is approximately 300 miles south of the nearest known population on the south rim of the Grand Canyon. Gill (1935) cited three areas for *A. abietinum* located between Grand Canyon and the Chiricahua Mountains: San Francisco Peaks, Arizona (*Abies* sp.), Mogollon, New Mexico, and Pinaleno Mountains, Arizona (*Abies lasiocarpa* [Hook.] Nutt. var. *arizonica* [Merriam] Lemm., corkbark fir). However, Hawksworth and Wiens (1972) reported that Gill's citations were based on occasional parasitism of *Abies* by *Arceuthobium douglasii*. Andrews and Daniels (1960) reported dwarf mistletoes on true fir on six plots distributed over the Apache, Gila, and Lincoln national forests and the Fort Apache Indian Reservation. These reports have subsequently been checked and were found to all be cases of parasitism of *Abies* by *A. douglasii* (Hawksworth pers. comm. 1976). Therefore, there are no known records of *A. abietinum* occurring between the Grand Canyon and the Chiricahua Mountains. Hawksworth and Wiens (1972) suggest that the scattered distribution of white fir in the Great Basin and southern Rockies may have prevented the spread of *A. abietinum* into these areas from its primary distribution in the Sierra Nevada and Cascade ranges.

The extremely isolated population of *A. abietinum* in the Chiricahua Mountains, which is near the southern limits of white fir, suggests that the mistletoe may have had a more southerly distribution in the past. Zavarin et al. (1975)

<sup>1</sup>University of Arizona Agricultural Experiment Station Article No. 2588.

<sup>2</sup>Department of Plant Pathology, University of Arizona, Tucson, Arizona 85721.

account for the separation of white fir into two varieties during the Pliocene and Pleistocene due to the formation of large arid regions between the western and eastern ranges of the species. As climatic conditions became warmer and drier, white fir migrated to higher montane elevations. *A. abietinum* may have been distributed in the lower areas white fir once occupied and may have been unable to adapt to the environmental conditions encountered at higher elevations. In a few locations, however, conditions remained favorable for its survival. This may also account for the extremely isolated population of *Phoradendron bolleanum* subsp. *pauciflorum* (Torr.) Wiens in the Santa Catalina Mountains of southern Arizona. The main distribution of this mistletoe is in California and it has not been found in other mountain ranges in Arizona.

Hawksworth and Wiens (1972) cite examples of dwarf mistletoe distributions which are probably best accounted for by seed dissemination by an avian vector. Studies of the importance of birds in the long-range dissemination of dwarf mistletoes have not been published, but many distributional patterns are known where this means of seed dispersal is the most likely explanation. One factor that must be considered is that dwarf mistletoes are dioecious and at least one male plant and one female plant must become established in an isolated area for a successful infestation. The accidental introduction of the

white fir dwarf mistletoe into the Chiricahua Mountains by an avian vector over such a large distance seems unlikely.

Representative collections of *A. abietinum* f. sp. *concoloris* from Mormon Canyon (Mathiasen 7602) have been filed at the University of Arizona Herbarium (ARIZ) and at the U.S. Forest Service Mistletoe Herbarium, Ft. Collins, Colorado (FPF).

I wish to express my appreciation to Drs. F. G. Hawksworth, U.S. Forest Service, Ft. Collins, Colorado; to R. L. Gilbertson and G. B. Cummins, Department of Plant Pathology, University of Arizona, Tucson, Arizona; and to Diane Ensign for her assistance in the collection of specimens.

#### LITERATURE CITED

- ANDREWS, S. R., AND J. P. DANIELS. 1960. Survey of dwarf mistletoes in Arizona and New Mexico. USDA Forest Service. RMPRES Station Paper 49. 17 pp.
- GILL, L. S. 1935. *Arceuthobium* in the United States. Connecticut Acad. Arts. Sci. Trans. 32:111-245.
- HAWKSWORTH, F. G., AND D. WIENS. 1972. Biology and classification of dwarf mistletoes (*Arceuthobium*). USDA Forest Service Agriculture Handbook 401. 234 pp.
- SCHARPF, R. F., AND J. R. PARMETER. 1967. The biology and pathology of dwarf mistletoe, *Arceuthobium campylopodum* f. *abietinum*, parasitizing true firs (*Abies* spp.) in California. USDA Forest Service Tech. Bull. 1362. 42 pp.
- ZAVARIN, E., K. SNAJBERK, AND J. FISHER. 1975. Geographic variability of monoterpenes from cortex of *Abies concolor*. Biochem. Sys. Ecol. 3:191-203.